

## ABSTRACT OF THE INVENTION

A -donor(D)-bridge(B)-acceptor(A)-bridge(B)- type block copolymer system, where donor (D) is an organic conjugated donor (p-type) block, acceptor (A) is an organic conjugated acceptor (n-type) block, and bridge (B) is a non-conjugated and flexible chain, has been designed and preliminarily tested for potential lightweight, flexible shape, cost-effective and high efficiency "plastic" thin film solar cell or photo detector applications. A 'tertiary supramolecular nanophase separated structure" derived from this -DBAB- block copolymer improves opto-electronic (photovoltaic) power conversion efficiency significantly in comparison to all existing reported organic or polymeric donor/acceptor binary photovoltaic systems due to the reduction of "exciton loss," the "carrier loss," as well as the "photon loss" via three-dimensional space (morphology) and energy level optimizations.